

# **Education**

**Presentations at the 2008 AIChE Annual Meeting**

**Philadelphia, Pennsylvania  
16 - 21 November 2008**

**ISBN: 978-1-61567-219-6**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571  
[www.proceedings.com](http://www.proceedings.com)

**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2008) by AIChE  
All rights reserved.

Printed by Curran Associates, Inc. (2009)

For permission requests, please contact AIChE  
at the address below.

AIChE  
3 Park Avenue  
New York, NY 10016-5991

Phone: (203) 702-7660  
Fax: (203) 775-5177

[www.aiche.org](http://www.aiche.org)

## TABLE OF CONTENTS

<b>A Method for the Consistent Creation and Quantitative Testing of Postoperative Pelvic Adhesions in a Porcine Model.....</b>	1
<i>Maureen E. ChEung, Bradford Fenton, M Michelle Evancho-Chapman, Mark Kovacik, Don Noe, Nicholas Ree, James Fanning, Stephanie T. Lopina</i>	
<b>Bandage Contact Lenses for Anti-Inflammatory Therapeutics.....</b>	2
<i>Jeney Zhang, Mark E. Byrne</i>	
<b>Designing Scaffolds with Optimal ChEmical and Physical Properties for Tissue Engineering.....</b>	3
<i>Courteneay Cannon, Anna Gromadzka</i>	
<b>Improvement of Fiber-Reinforced Composites.....</b>	13
<i>Danny E. Kress</i>	
<b>Preliminary Design and Cost Analysis of a Distillation Column for Separation of Methanol, Water and a High Boiling Point Inorganic Acid .....</b>	18
<i>Nicole L. Felgenhauer, Robert R. Thompson, Mani Firouzain, Sawinder Singh</i>	
<b>Removal of Parathyroid Hormone by Immunospecific Adsorption during Kidney Dialysis.....</b>	19
<i>Shu Xia, Nichole Y. Hodge, Melvin Laski, Theodore F. Wiesner</i>	
<b>Seed-Mediated Growth of Platinum Nanoparticles Via Green ChEmical Reduction of Platinum Salts .....</b>	20
<i>Tyler M. Gunn</i>	
<b>Synthetic Routes to Photoactive Nanostructured Hydrogels .....</b>	21
<i>Alexander Thomas Leonard, Travis S. Bailey</i>	
<b>Vapor Deposited Polymer Coatings for Implantable Neuroprosthetic Devices .....</b>	22
<i>Kyle D. Stephens</i>	
<b>Characterizing Water in Oil Emulsions with Application to Methane Hydrate Formation.....</b>	23
<i>Clint P. Aichele, Walter G. Chapman</i>	
<b>Physics and Fabrication of Nanostructured Materials .....</b>	24
<i>Mustafa Akbulut</i>	
<b>Quantitative, Multinuclear Magnetic Resonance Microscopy Methods for the Study of Multiphase Systems .....</b>	25
<i>Belinda S. Akpa</i>	
<b>Overview of a Vapor Deposited Thin Silica Film.....</b>	27
<i>A. Anderson, W. Robert Ashurst</i>	
<b>Polymer Thin Film Nanoassemblies for Electrochemical Energy Conversion Devices .....</b>	28
<i>Avni A. Argun</i>	
<b>Water Interaction and Diffusion on Platinum Surfaces .....</b>	29
<i>Liney Arnadottir, Eric M. Stuve, Hannes Jónsson</i>	
<b>Conductive Polymer and Hydrogel Composites as Functional Biomaterials .....</b>	30
<i>Carolyn L. Bayer, Nicholas A. Peppas</i>	
<b>How to Make An Information Processing Device out of RNA.....</b>	31
<i>Chase L. Beisel, Christina Smolke</i>	
<b>Advanced Material Architectures for Tissue Engineering and Drug Delivery Applications .....</b>	33
<i>Danielle S.W. Benoit, Patrick S. Stayton, Kristi Anseth</i>	

<b>Homogeneous and Heterogeneous Acid Catalysis of Lipids to Produce Green Fuels: Advancing Biofuels in a Fossil Fuel World.....</b>	35
<i>Tracy J. Benson</i>	
<b>Protein and Surfactant Interactions: Applications to Protein Crystallization, Stability and Design.....</b>	38
<i>Bryan Berger</i>	
<b>Formation and Pinch-off of Viscoelastic Filaments: Numerical Analysis and Ink-Jet Experiments.....</b>	40
<i>Pradeep P. Bhat</i>	
<b>Molecular Logic Circuits for Information Processing in Human Cells .....</b>	41
<i>Leonidas Bleris</i>	
<b>Understanding Multiscale Single-Molecule Dynamics with New Computational Statistics Methods .....</b>	42
<i>Christopher P. Calderon</i>	
<b>Bio-Based Materials from Renewable Resources.....</b>	43
<i>Alejandrina Campanella</i>	
<b>Electrochemically Induced Charge Transfer to Wide Band Gap Semiconductors and Its Implication to Nanowire Based Solar Cells .....</b>	44
<i>Vidhya Chakrapani</i>	
<b>Complete Flux Elucidation Using Metabolic Flux Analysis.....</b>	45
<i>YoungJung Chang, Patrick F. Suthers, Costas D. Maranas</i>	
<b>Multiscale Modeling for Energy Applications.....</b>	47
<i>Abhijit Chatterjee, Dion Vlachos, Blas P. Uberuaga, Arthur F. Voter</i>	
<b>Molecular Mechanisms for the Aggregation of Proteins and Therapeutic Antibodies.....</b>	49
<i>Naresh ChEnnamsetty</i>	
<b>Photoreactive Ultrafiltration Membranes for Prevention of Biofouling.....</b>	50
<i>Shannon Ciston, Richard M. Lueptow, Kimberly Gray</i>	
<b>Engineering Approaches in Neuroscience .....</b>	51
<i>David Colby</i>	
<b>Colloidal Suspensions: Fundamental Physics and Engineering Applications .....</b>	52
<i>Jacinta C. Conrad</i>	
<b>Catalytic Strategies for the Molecular Engineering of Fuels .....</b>	54
<i>Steven P. Crossley, Daniel E. Resasco</i>	
<b>Classical ChEmical Engineering Is Alive and Well .....</b>	55
<i>Benjamin J. Davis</i>	
<b>Fischer Tropsch Synthesis and Related Technologies .....</b>	56
<i>Ed Durham</i>	
<b>Investigating Dynamic Penetrant Transport in Glassy Polymers for High-Tech Applications .....</b>	57
<i>Adam K. Ekenseair, Nicholas A. Peppas</i>	
<b>Analytical Ultracentrifugation of Colloidal Nanomaterials for Disease Detection and Drug Delivery Applications.....</b>	58
<i>James B. Falabella</i>	
<b>Enhanced CO<sub>2</sub> Solubility in Aromatic and Alkyl Chain Substituted Imidazolium-Based Room Temperature Ionic Liquids .....</b>	59
<i>Alexia Finotello, Jason E. Bara, Suguna Narayan, Douglas L. Gin, Richard D. Noble</i>	

<b>Photopolymerized pH-Responsive Nanomaterials for Applications in Nanomedicine .....</b>	60
<i>Omar Z. Fisher, Timothy Kim, Stephen R. Dietz, Nicholas A. Peppas</i>	
<b>Supercritical and Expanded Solvent Systems for the Sustainable Utilization of Biomass Feedstocks.....</b>	61
<i>Jackson W. Ford, Raghunath V. Chaudhari, Bala Subramaniam, Charles A. Eckert</i>	
<b>Nanobiomaterials and Therapeutic Systems .....</b>	62
<i>Harvinder S. Gill</i>	
<b>Polymer-Directed Self-Assembly as a Highly Flexible Route to Multifunctional Nanomaterials .....</b>	63
<i>Marian E. Gindy, Robert K. Prudhomme</i>	
<b>Molecularly Engineered Nanoporous Adsorbents: Synthesis, Characterization, and Application .....</b>	64
<i>T. Grant Glover</i>	
<b>A Novel Three-Stage Treatment for Brackish Water Reverse Osmosis Concentrate: Treatment and Analysis of a Real Brackish Water .....</b>	65
<i>Lauren F. Greenlee, Elise Barbot, Benny D. Freeman, Desmond F. Lawler, Benoit Marrot, Philippe Moulin</i>	
<b>Novel Fabrication Methods for the Production of Polymer Films: Initiated Chemical Vapor Deposition and Templated Formation of Ionotropic Gels Using Patterned Paper .....</b>	67
<i>Malancha Gupta</i>	
<b>Colloidal Assembly in Microfluidic Devices .....</b>	69
<i>Ramin Haghgoie</i>	
<b>Electrodeposited Nanowires for Sensing, Energy Conversion, and Logic Devices .....</b>	70
<i>Carlos Hangarter</i>	
<b>Nanoengineering Systems for Targeted Drug Delivery, Cell-Based Therapy, and Microfluidic Biosensors/Chips.....</b>	71
<i>Hongyan He</i>	
<b>Understanding the Catalytic Activity of Bi- and Monometallic Pd and Au Catalysts for Aqueous Reactions.....</b>	73
<i>Kimberly N. Heck</i>	
<b>Relating Structure, Function, and Mechanics in Surfactant-Colloid Mixtures .....</b>	75
<i>Matthew H. Helgeson, Norman J. Wagner, Eric Kaler</i>	
<b>Reconstruction of a New Genome-Scale Model of <i>B. Subtilis</i> .....</b>	77
<i>Christopher Henry, Jenifer Zinner, Matthew Cohoon, Edmond Jolivet, Kosei Tanaka, Sabine Autret, Philippe Noirot, Rick Stevens</i>	
<b>Biological Production of Renewable Energies from Waste Materials.....</b>	79
<i>Sage R. Hiibel</i>	
<b>Dynamics of Complex Fluids and Complex Flows near Surfaces.....</b>	80
<i>Nazish Hoda</i>	
<b>Fundamental Interactions at Biomolecular Interfaces: An Integrated Simulation and Experimental Approach .....</b>	82
<i>Jason C. Hower, Shaoyi Jiang</i>	
<b>Plastic Solar Cells from Nano-Patterned Fullerenes and Semi-Conducting Polymers.....</b>	83
<i>J. J. Huang</i>	
<b>Phase Behavior of Polymer Tethered Nanoparticles .....</b>	84
<i>Christopher R. Iacovella, Sharon C. Glotzer</i>	

<b>Molecular Simulation and Computational Design of Materials for Energy and Environmental Applications .....</b>	86
<i>Ahmed E. Ismail</i>	
<b>Engineering Cells and Tissues for Therapeutic Applications Via Simulation and Experiment .....</b>	87
<i>Ehsan Jabbarzadeh</i>	
<b>Creation of ChEmical Patterns for Directed Assembly of Block Copolymers .....</b>	88
<i>Shengxiang Ji, Paul Nealey</i>	
<b>3-Dimensional in Vitro Model of Hepatic Tissue for Investigating Liver Physiology and Pathophysiology .....</b>	89
<i>Rohit Jindal</i>	
<b>Controlling Nanoparticle Location in Block Copolymers Using External Fields: Simulations and Experiments .....</b>	90
<i>Vibha Kalra</i>	
<b>The Development and Reactivity of Oxide Phases on Pd(111) Utilizing Gas Phase Oxygen Atom Beams in Ultra High Vacuum .....</b>	97
<i>Haywood H. Kan, Jose A. Hinojosa, R. Bradley Shumbera, Robert J. Colmyer, Jason F. Weaver</i>	
<b>Functional Nanotechnology for Imaging and Therapy.....</b>	98
<i>Efstathios Karathanasis</i>	
<b>Transport Processes at the Micron Scale.....</b>	100
<i>Aditya S. Khair</i>	
<b>Engineering Novel Surfaces for Tissue Engineering and Drug Delivery Applications.....</b>	102
<i>Srivatsan Kidambi</i>	
<b>High-Throughput Functional Screening of Human cDNA Libraries for Novel Regulators of Innate Immune Responses .....</b>	104
<i>Hwijn Kim, Brian Seed</i>	
<b>Surface ChEmistry of Oxide Clusters as Model Catalyst.....</b>	105
<i>Yu Kwon Kim</i>	
<b>Studies of Polymer Dynamics, Interfaces, and the Impact of Small Molecule Functionality on Electronic Properties .....</b>	106
<i>Robert J. Klein</i>	
<b>Nano/Microdevices for Biomedical Applications .....</b>	108
<i>ChEe Guan Koh</i>	
<b>Skin Tissue Engineering: Development of Treatment Strategies for Skin Diseases &amp; Wound Repair and Regeneration .....</b>	109
<i>Piyush Koria</i>	
<b>Factors Influencing Product Selectivity in Heterogeneous Catalysis: Examination of Monodisperse Platinum and Rhodium Nanoparticles .....</b>	110
<i>John N. Kuhn</i>	
<b>Soft Materials Mechanics towards Development of High Performance Structural Materials, Bio-Implants, and Energy Storage Materials .....</b>	111
<i>Santanu Kundu</i>	
<b>Potential Applications of Laser-Capture Microdissection-Based Proteomics in the Study of Disease Progression.....</b>	114
<i>Carla M. R. Lacerda</i>	
<b>Single Molecule ChEmically Amplified Photoresists for Nanolithography .....</b>	115
<i>Richard Lawson, Clifford L. Henderson, Laren M. Tolbert</i>	

<b>Engineering Nanomaterials for Bioimaging and Therapeutic Applications</b>	116
<i>Dongwon Lee</i>	
<b>Simulation and Experimental Studies of the Interactions of Membranes with Peptides, Synthetic Polymers and Nanoparticles</b>	117
<i>Hwankyu Lee</i>	
<b>New Biotherapy and Drug Delivery for Inflammatory Diseases</b>	120
<i>Sungmun Lee</i>	
<b>Systems Biology: From Identifying Toxicity Pathways to Therapeutic Engineering</b>	121
<i>Zheng Li, Christina Chan, James J. Collins</i>	
<b>Implementation of Green ChEmistry and Engineering Principles into Nanomaterial Synthesis and Processing</b>	124
<i>Juncheng Liu, Christopher B. Roberts</i>	
<b>Computational ChEmical Engineering</b>	125
<i>Eric L. Maase</i>	
<b>Nano-Scale Materials for Energy and Environmental Applications</b>	126
<i>Mainak Majumder</i>	
<b>Biocompatible Thin Films for Use in Tissue Engineering</b>	127
<i>Holly J. Martin, Kirk H. Schulz</i>	
<b>Development of Reactive Nanostructured Systems for Energy, Environmental and Biomedical Applications</b>	129
<i>Karen S. Martirosyan</i>	
<b>Rational Design of Catalysts for Energy through Fundamental Research</b>	130
<i>Carl A. Menning, Jingguang G. ChEn</i>	
<b>Systems Biology Approaches to Studying Intracellular Signaling Interactions Between Virus and Host</b>	131
<i>Kathryn Miller-Jensen, Douglas A. Lauffenburger, David V. Schaffer</i>	
<b>ChEmical Energy Conversion: Molecular Approach towards the Discovery of Efficient and Environmentally Friendly Heterogeneous Catalysts and Electro-Catalysts</b>	132
<i>Eranda Nikolla, Johannes W. Schwank, Suljo Linic</i>	
<b>Development of Fundamental Models of Single-Site Olefin Polymerization Kinetics</b>	133
<i>Krista A. Novstrup, W. Nicholas Delgass, Mahdi M. Abu-Omar, James M. Caruthers</i>	
<b>Optically Integrated Microfluidic Diagnostic Tools</b>	134
<i>John Oakey</i>	
<b>Heterologous Expression of Membrane Proteins in <i>Saccharomyces Cerevisiae</i> Enables Biophysical Characterization of Pharmaceutical Targets</b>	135
<i>Michelle O'Malley, Anne Skaja Robinson</i>	
<b>Synthesis and Applications of Organic Functionalized Nanoporous Silica</b>	137
<i>Gifty Osei-Prempeh</i>	
<b>Engineering Colloidal Quantum Dot-Based Electronic Devices for Solar Energy Conversion and Color Display Applications</b>	138
<i>Matthew J. Panzer</i>	
<b>Multiscale Biophysics: Theory and Application to the Dynamics of Actin and Actin-Related Structures</b>	139
<i>Jim Pfaendtner</i>	
<b>Micro/Nanofluidic Devices for Sensing and Reaction Engineering</b>	140
<i>Adarsh D. Radadia</i>	

<b>High Recovery Desalination of Brackish Water.....</b>	142
<i>Anditya Rahardianto</i>	
<b>The Impact of Microstructure on the Gravitationally-Induced Phase Separation in Concentrated Vesicle Dispersions.....</b>	144
<i>Arun Ramachandran</i>	
<b>Control of Heterogeneous Polymer Properties through the Use of Nanoparticle and Antiplasticizer Additives .....</b>	145
<i>Robert A. Riggelman, Juan J. de Pablo</i>	
<b>Mechanistic Investigations of Crystallization: From Self-Assembled Nanomaterials to Pathological Biomineratization.....</b>	146
<i>Jeffrey D. Rimer, Michael D. Ward, Raul F. Lobo, Dion Vlachos</i>	
<b>Physical Aging and Gas Permeability in Ultra-Thin Glassy Polymer Films .....</b>	149
<i>Brandon W. Rowe, Benny D. Freeman, Donald R. Paul</i>	
<b>Neural Nanotechnology: Nanomaterials for Molecular Imaging and Therapy.....</b>	150
<i>Gang Ruan</i>	
<b>Challenges in the Modeling of the Gas Plasma-Biomaterial Interaction .....</b>	151
<i>Yukinori Sakiyama, David B. Graves</i>	
<b>Green Nanotechnology, Engineering and Synthesis for Energy, Biomedical and Environmental Applications .....</b>	152
<i>Carl D. Saquing</i>	
<b>Incorporation of Non-Linear Methods into Genome-Scale Models: Expanding the Model for the Butanol Producer Clostridium Acetobutylicum .....</b>	155
<i>Ryan S. Senger, Eleftherios T. Papoutsakis</i>	
<b>Designer Emulsions Using Microfluidics and Their Applications .....</b>	156
<i>Rhutesh K. Shah</i>	
<b>Sustainable Energy and Environmental Resource Management: a Systems Theory Approach .....</b>	158
<i>Yogendra Shastri</i>	
<b>Engineering Protein Assemblies for Physicochemical Studies and Biomedical Applications .....</b>	159
<i>Hadley D. Sikes</i>	
<b>Generation of Renewable Fuels and ChEmicals from Lipids Via Supercritical Fluid Processing .....</b>	161
<i>Darrell L. Sparks</i>	
<b>Genome-Scale Model of a Minimal Organism: Mycoplasma genitalium .....</b>	164
<i>Patrick F. Suthers</i>	
<b>Preparation of Heterogeneous Nanostructures for Catalytic and Magnetic Applications .....</b>	165
<i>Xiaowei Teng</i>	
<b>Synthesis of Reactive Copolymer Thin Films by Initiated ChEmical Vapor Deposition and Applications .....</b>	167
<i>Wyatt E. Tenhaeff, Karen K. Gleason</i>	
<b>Studies at the Interface of Materials Science and Bioengineering: New Tools to Assess Conformational Changes in Protein Solution Structure .....</b>	168
<i>Efrosyni Themistou, Paschalis Alexandridis, Sriram Neelamegham</i>	
<b>Effects of Nanoparticle Addition on the Surface and Bulk Properties of Polymers .....</b>	169
<i>Anish Tuteja, Wonjae Choi, Joseph M. Mabry, Gareth H. McKinley, Robert E. Cohen</i>	

<b>From Fundamentals to Functionality in Fluidic Systems.....</b>	173
<i>O. Berk Usta</i>	
<b>Organ Engineering .....</b>	174
<i>Korkut Uygun</i>	
<b>Electronic Device Fabrication from Engineered Inorganic Nanomaterial-Conducting Polymer Composites .....</b>	176
<i>Sreeram Vaddiraju, Karen K. Gleason</i>	
<b>Novel Liquid Crystal Networks .....</b>	177
<i>Rafael Verduzco</i>	
<b>Thermal and Electrochemical Activation in Hydrogen Production for Fuel Cell Applications.....</b>	178
<i>Saurabh A. Vilekar</i>	
<b>Optimization of 3D Porous Scaffold Structure for Favorable Fluid Shear and Nutrient Transport Inside a Perfusion Bioreactor .....</b>	180
<i>Roman S. Voronov, Samuel VanGordon, Dimitrios Papavassiliou, Vassilios I. Sikavitsas</i>	
<b>Dependence of Fluid Slip Over Superhydrophobic Surfaces on Equilibrium.....</b>	181
<i>Roman S. Voronov, Lloyd L. Lee, Dimitrios Papavassiliou</i>	
<b>Liposomal Nanomedicine: Multi-Compartment Structure and Remotely Triggered Release.....</b>	182
<i>Guohui Wu</i>	
<b>Quantitative Analysis of the Effects of Hydrodynamic Shear on the Textural and Areal Parameters of <i>S. Aureus</i> Biofilms.....</b>	183
<i>Patrick Ymele-Leki, Julia M. Ross</i>	
<b>High Density, Vertically-Aligned Carbon Nanotube Membranes with High Fluxes .....</b>	184
<i>Miao Yu, John L. Falconer, Rich Noble</i>	
<b>Micromagnetic - Microfluidic Biomedical Device for Sepsis Therapy.....</b>	186
<i>Chong Wing Yung, Jason Fiering, Mark Puder, Donald E. Ingber</i>	
<b>Surface Interactions in Polymer and Biological Systems at the Micro and Nano Scales.....</b>	187
<i>Hongbo Zeng, Jacob N. Israelachvili, Matthew Tirrell</i>	
<b>Engineered Biosynthesis of Natural Products .....</b>	188
<i>Wenjun Zhang, Yi Tang</i>	
<b>Polymer Films and Ribbons from Electrospinning of Polymer Solutions .....</b>	189
<i>Pratyush Dayal</i>	
<b>Targetted Cell Encapsulation .....</b>	190
<i>Pratyush Dayal</i>	
<b>Providing An Industry-Relevant Perspective to the Process Control Curriculum with Simulation Tools .....</b>	191
<i>Douglas Cooper, Rachelle Howard</i>	
<b>The Polymath-Excel-Matlab (PEM) Problem Solving System .....</b>	193
<i>Michael B. Cutlip, Mordechai Shacham, Michael Elly</i>	
<b>Using Process Simulators in the Study, Design and Control of Distillation Columns for Undergraduate ChEmical Engineering Courses .....</b>	194
<i>Iván Dario Gil Chaves, Tomás Castrellón, Diana Carolina Botía Gil</i>	
<b>Real Labs Operated Remotely 24/7.....</b>	195
<i>Jim Henry</i>	

<b>Superpro Designer: An Interactive Software Tool for Designing and Evaluating Integrated ChEmical, Biochemical, and Environmental Processes.....</b>	196
<i>Nirupam Pal, Charles Siletti, Demetri Petrides</i>	
<b>Simulations for Inquiry-Based Experimentation In Thermodynamics and Heat Transfer .....</b>	197
<i>Margot A.-S. Vigeant, Michael J. Prince, Gavin MacInnes</i>	
<b>Nanomaterials Curricula: An Interdisciplinary Module for ChEmical Engineering.....</b>	198
<i>Holly A. Stretz, Chris Wilson</i>	
<b>Integrating Laboratory Modules Based on Scanning Probe Methods into Undergraduate Engineering Education .....</b>	199
<i>Daniel B. Knorr Jr., Jason P. Killgore, Tomoko Gray, Joseph Wei, Yeechi ChEn, Christopher So, Hanson Fong, David S. Ginger Jr., Mehmet Sarikaya, Rene M. Overney</i>	
<b>Outcomes of a ChEmical Engineering Option within a General Engineering Program at a Liberal Arts College.....</b>	200
<i>Michael J. Misovich, Jericho L. Moll, Kurtis F. Blohm, Emily J. Walsh</i>	
<b>Lessons In the Operation and Control of Steam Boilers for Power Production and Heating.....</b>	212
<i>Douglas Cooper, Robert Rice, Allen D. Houtz</i>	
<b>Teaching and Learning Gibbs Free Energy and the Phase Equilibrium Criteria through 3D Phase Diagrams for Pure Components .....</b>	214
<i>L. G. Ríos-Casas, A. Alarcón-García, D. R. Téllez-Muradás, J. R. Flores-Tapia, Nelly Ramírez-Corona</i>	
<b>The Soccer Ball Model. A Powerful Pok to Approach up-Scaling In the Classroom .....</b>	215
<i>Jennifer Anne Pascal, Cynthia Torres, Pedro E. Arce</i>	
<b>Facilitating Interdisciplinary Learning through Incorporation of Biotech Applications.....</b>	216
<i>Claire Komives</i>	
<b>Demonstration Experiments on Physical Surface Science for Middle Schools.....</b>	217
<i>Ranga Narayanan</i>	
<b>Forging Links Between ChEmical/bioengineering Programs and Middle School and High School Math/science Programs .....</b>	218
<i>Richard Zollars, Donald C. Orlich</i>	
<b>Texts for the 21st Century.....</b>	219
<i>Carl R. F. Lund</i>	
<b>Preliminary Testing of a .Net Based Educational Heat Transfer Simulator .....</b>	220
<i>Peyton C. Richmond, Sidney Lin</i>	
<b>Concepts of Nanoscience for Non-Scientists .....</b>	235
<i>Tamara Floyd-Smith, David Baah, James Bradley, Michelle Sidler, Rosine Hall, Christine Curtis</i>	
<b>Moral Theory, Ethics and Economics: Decision-Making Tools.....</b>	239
<i>Eric L. Maase</i>	
<b>Strategies for Improving the Recruitment and Retention Rates of Women and Minority Students in ChEmical Engineering .....</b>	240
<i>Felecia Nave</i>	
<b>ChEmical Engineering Undergraduate Curriculum Reform, Development and Assessment: a "Strings" Approach.....</b>	241
<i>Lale Yurttas, Larissa Pchenitchnaia</i>	
<b>Mechanistic Studies on the Activation of a Carbon-Carbon Single Bond Via Palladium-Catalyzed <math>\beta</math>-Alkyl Elimination .....</b>	247
<i>Jeffrey B. Johnson, Valerie Winton</i>	

<b>Poly-Acrylic Acid Functionalized Membranes for Iron Immobilization and Fenton Reaction .....</b>	248
<i>Alex Montague, Scott R. Lewis, Dibakar Bhattacharyya</i>	
<b>Optimizing the Impregnation of Catalysts: Examining the Saturation of Alumina Particles In a Double Cone Blender .....</b>	249
<i>Dustin Kucko, Charles Radeke, Arthur W. ChEster, M. Silvina Tomassone</i>	
<b>Palladium Removal from Reaction Mixtures by Fixed Bed Adsorption.....</b>	250
<i>Caitlin A. Boyd, Brian G. Lefebvre, Sonia Berberana, Robert P. Heskeith, Laura Kuczynski, Dr. Stephanie Farrell, Pamela Kubinski, Megerle Scherholz, Michael J. Girgis</i>	
<b>Reactor Simulation for Industrial Process Using Sulfite Oxidation in Water.....</b>	251
<i>Ruth E. Kuilan</i>	
<b>Dependence of the Hydrolytic Degradation of Poly(ester-anhydride) Copolymers on pH, Temperature, and Time.....</b>	252
<i>Mathew D. Rowe, Sarah Crosby, Keisha B. Walters</i>	
<b>Development of a Consumer-Friendly Indoor Air Monitoring Device .....</b>	253
<i>Karen C. Dannemiller</i>	
<b>Design of a Laboratory Scale Pyrolysis System for Evaluating the Recycle Potential of Cca-Treated Wood Waste .....</b>	254
<i>Melissa Cook, Amy M. Parker, Mark Bricka</i>	
<b>Non-Isothermal Solidification of Polymer-Drug Melts: Crystallization .....</b>	255
<i>Marlena Brown, Paul Takhistov</i>	
<b>Evaluation of Sodium Alginate for Protein Drug Delivery .....</b>	257
<i>Fuyue Li, Yinyan Zhao, Michael Harris</i>	
<b>Experimental and Numerical Modeling of Granular Mixing in a Coater Pan.....</b>	258
<i>Robert Yau, Ekneet Sahni, Bodhisattwa Chaudhuri</i>	
<b>pH-Triggerable Liposomes for Delivery and Release of Doxorubicin .....</b>	259
<i>Amey Bandekar, Shrirang Karve, Stavroula Sofou</i>	
<b>Soluble Tissue Factor: Experiments In Silico.....</b>	260
<i>Erik John Haussmann, Kristin Patterson, Coray M. Colina</i>	
<b>A Novel Approach to Cross-Linking Gelatin Matrices .....</b>	261
<i>Steven Castleberry</i>	
<b>Bioreactive Membranes through Layer-by-Layer Assembly.....</b>	262
<i>Caitlyn R. Cecil, Saurav Datta, D. Bhattacharyya</i>	
<b>Gold Nanoparticle Based Protease-Detecting Biosensor .....</b>	263
<i>Kathleen A. Vermeersch, Craig D. Buckley, Jessica O. Winter</i>	
<b>Sonicated Drug Delivery.....</b>	NA
<i>Peter W. Jones</i>	
<b>Ribosome Kinetics and Aa-tRNA Competition Determine Rate and Fidelity of Peptide Synthesis .....</b>	264
<i>Aaron M. Fluit, Elsje Pienaar, Hendrik J. Viljoen</i>	
<b>Production of Poly (3-Hydroxybutyric Acid) from Waste Sweet Potato Starch .....</b>	265
<i>James D. Winkler, Ratna Sharma, Mari S. Chinn</i>	
<b>Experimentally Validated Numerical Modeling Study of Mixing in a Coating Pan .....</b>	266
<i>Robert Yau, Ekneet Sahni, Bodhi Chaudhuri</i>	
<b>The Effect of Cholesterol on Lung Surfactant.....</b>	267
<i>Jacob M. Vestal, Siegfried Steltenkamp, Joesph A. Zasadzinski</i>	

<b>Non Bacterial SYNTHESIS of Biofuel from Cellulose .....</b>	268
<i>Praveen Kumar Gorakavi, venkata Basava Rao V, Sailu Ch, Laxminarayana P</i>	
<b>Effect of Calcium and Sodium Deposition on a Pemfc .....</b>	279
<i>Steven Mouton</i>	
<b>Techniques to Improve the Use of Biomass Fuels Used to Provide Heating to the Facilities at the Natchez Trace Greenhouses .....</b>	280
<i>Derek J. Rice, Mark Bricka, Monty Singletary</i>	
<b>Preliminary Design of Bioethanol Process Plants .....</b>	281
<i>Anne Gryggaard, Camilla Berg</i>	
<b>Physiochemical Surface Properties of Lung Tissues for Modeling Drug Deposition.....</b>	282
<i>Michael Lamb, Mathew D. Rowe, Keisha B. Walters</i>	
<b>Cfd Simulation and Modeling of Conduction Heat Transfer at the Wall of a Packed Reactor Tube.....</b>	283
<i>Amanda K. Gurnon, Anthony G. Dixon, Michiel Nijemeisland, Hugh Stitt</i>	
<b>Cuo Nanospheres Based Non-Enzymatic Glucose Sensor.....</b>	284
<i>Michael Gentile, Eliot Reitz, Wenzhao Jia, Yu Lei</i>	
<b>Generalized Vapor Pressure Prediction Consistent with Cubic Equations of State .....</b>	285
<i>Laura L. Petrasky, Michael J. Misovich</i>	
<b>Applying a Low Temperature Limit of a Cubic Equation of State to Model Pure Component Phase Equilibrium.....</b>	293
<i>Caitlin A. Kowalsky, Joshua L. Lancer, Emily J. Walsh, Kimberly Wadelton, Michael J. Misovich</i>	
<b>Fabrication of Microarray-Based ELISA Via Micromolding in Capillaries.....</b>	302
<i>Kuo-Feng Lo, Yi-Je Juang</i>	
<b>Impact of Calcium Citrate Precipitation on the Reaction of Citric Acid-Calcite.....</b>	303
<i>Mohammed H. AlKhaldi Sr., Hisham Nasr-El-Din, Hemanta Sarma</i>	
<b>CdS/CdTe Thin Film Solar Modules and Atmospheric Pressure Physical Vapor Deposition.....</b>	312
<i>Brian Ashenfelter</i>	
<b>Metal Oxide Nanofiber and Its Application in Gas Sensing .....</b>	313
<i>Ashley Schempf, Wenzhao Jia, Yu Lei</i>	
<b>The Effect of Collector Geometries on the Nanofiber Alignment.....</b>	314
<i>Matthew Cagnetta, Wenzhao Jia, Yu Lei</i>	
<b>Polyhedral Oligomeric Silsesquioxane Coatings Stimulate Osteoblast Attachment to Cp-Ti .....</b>	315
<i>Jacob G. Dickinson, Jacob P. Lyons, Michael J. Misovich, Andre Y. Lee, Melissa J. Baumann</i>	
<b>Photopatterned Nanoporous Polymer Monoliths as Passive Mixers to Enhance Mixing Efficiency for on-Chip Labeling Reaction .....</b>	316
<i>Thomas Schwei</i>	
<b>Determining Applicability of Known Material Equations to Biomaterial Models and Basic Characterization of Blood Vessel Performance.....</b>	317
<i>Kevin P. Timms, Robert J. Wilkens</i>	
<b>Effect of Diameter on Band Pattern Formation of Silica Nanoparticles by Convective Assembly .....</b>	318
<i>Kayla L. Reibel, Alex Lee, Michael Tsapatsis</i>	
<b>Characterization of the Nafion Fuel Cell Membrane Via Observation of Surface Wetting Properties.....</b>	319
<i>Sharonmoyee Goswami, Shannon Klaus, Jay B. Benziger</i>	

<b>Formation of Magnetite Clusters Using a Confined Impinging Jet Mixer .....</b>	320
<i>Holly L. Sewell, Raquel Mejia-Ariza, Will Miles, Jonathan Goff, Richey M. Davis, Judy S. Riffle</i>	
<b>A Roadmap for Sustainable Development .....</b>	328
<i>Jeshua D. Gonzalez</i>	
<b>Applying New Technologies to the Classroom – What Have We Learned from Past Experience .....</b>	329
<i>Mordechai Shacham</i>	
<b>Concurrently Collaborative Spreadsheets in the ChEmical Engineering Classroom.....</b>	336
<i>David L. Silverstein</i>	
<b>Wiki Technology as a Design Tool for a Capstone Design Course .....</b>	346
<i>Kevin R. Hadley, Kenneth A. Debelak</i>	
<b>Software Programming Features That Facilitate Process Control Education .....</b>	356
<i>Ricardo Dunia, Thomas F. Edgar, Ivan Castillo</i>	
<b>Virtual Learning Environment as a Conceptual Tool in Phase Equilibrium Course at Universiad De Los Andes .....</b>	358
<i>Gabriel Camargo, Joaquin Tirano, Mariano Lopez, Astrid Altamar</i>	
<b>Application of Multimodal Software Tools to Teach Problem Solving Skills.....</b>	364
<i>Paul Blowers</i>	
<b>Technology In Computer Lab Environments: Challenges and Opportunities.....</b>	365
<i>Eric L. Maase</i>	
<b>A Course Module on ChEmical Product Design .....</b>	366
<i>James C. Watters</i>	
<b>Modular Teaching and Open Ended Design Projects.....</b>	377
<i>Yaşar Demirel</i>	
<b>Alternative Fuel Feasibility Study as the Process Engineering Senior Design Course .....</b>	384
<i>Katsuyuki Wakabayashi, James E. Maneval, William J. Snyder, Michael E. Hanyak</i>	
<b>Project Engineering as Senior Design: Moving from Paper to Practice .....</b>	385
<i>Margot A.-S. Vigeant, James E. Maneval, William Snyder, Michael J. Prince, Michael Hanyak</i>	
<b>A Study of the Effects on Dissolution Constants and Activation Energy in a Stirred Tank .....</b>	386
<i>Gustavo Adolfo Orozco, Fabio Enrique Fajardo, Clara Tatiana González</i>	
<b>Application of Heat and Mass Transfer Analogies In the Undergraduate Engineering Laboratory to Estimate Time of Death .....</b>	388
<i>Jimmy L. Smart</i>	
<b>New Laboratory Course for Today's ChEmical Engineering Students .....</b>	390
<i>Mark T. Aronson, Robert J. Davis</i>	
<b>Teaching Material and Energy Balances to First-Year Students Using Cooperative Team-Based Projects and Labs .....</b>	391
<i>Timothy M. Raymond, Michael Hanyak</i>	
<b>Detecting and Preventing Common Errors during Numerical Problem Solving.....</b>	392
<i>Mordechai Shacham, Michael B. Cutlip, Michael Elly</i>	
<b>Why Is the Fundamental of Engineering Exam (FE) Important to ChEmical Engineers and the Use of the FE as One Assessment Tool for the ChEmical Engineering Programs.....</b>	400
<i>R. Mark Bricka</i>	
<b>A Degree-Project Approach to Engineering Education .....</b>	401
<i>C. Ted Lee Jr., Gisele Ragusa</i>	

<b>Targeted Infusion Project: Implementation of a Bioengineering Concentration in the Department of ChEmical Engineering at Prairie View A&amp;M University .....</b>	402
<i>Felecia Nave, Michael Gyamerah, Irvin Osborne-Lee</i>	
<b>Implementing Concepts of Pharmaceutical Engineering into High School Science Classrooms.....</b>	410
<i>Howard S. Kimmel, Linda Hirsch, Laurent Simon, Levelte Burr-Alexander, Rajesh Dave</i>	
<b>In Search of the Active Site of Pmmo Enzyme: Partnership Between a K-12 Teacher, a Graduate K-12 Teaching Fellow and a Research Mentor .....</b>	419
<i>Katherine K. Bearden, Tanya Culligan, Daniela S. Mainardi</i>	
<b>The Polymer Envoys Program: A Study on the Effectiveness of An Innovative Research Program for Urban High School Students.....</b>	427
<i>LaRuth C. McAfee</i>	
<b>K-5 STEM Enrichment Activities with Guilford County Schools and North Carolina Aa&amp;tamp;T State University .....</b>	429
<i>Kenneth L. Roberts, Sophia R. Roberts</i>	
<b>Using LegoTM Robotics for K-12 Engineering Outreach.....</b>	430
<i>Bill B. Elmore, Emma Seiler</i>	
<b>Process Technology Summer Institutes for K-12 and Community College Educators and Students .....</b>	431
<i>Steve R. Duke, Gopal Krishnagopalan, R. Dale Smith, Ralph Benefiel, Charles Shepherd</i>	
<b>Introduction.....</b>	432
<i>Robert Wellek</i>	
<b>NSF CBET Overview and Other NSF Programs .....</b>	433
<i>John McGrath</i>	
<b>Highlights of CBET Cluster on ChEmical, Biochemical &amp; Biotechnology Systems .....</b>	434
<i>John Regalbuto</i>	
<b>Highlights of CBET Cluster on Transport and Thermal Fluids Phenomena .....</b>	435
<i>Phillip R. Westmoreland</i>	
<b>Highlights of CBET Cluster on Environmental Engineering &amp; Sustainability .....</b>	436
<i>Trung Van Nguyen</i>	
<b>Highlights of CBET Cluster on Biomedical Engineering and Engineering Healthcare .....</b>	437
<i>Semahat S. Demir</i>	
<b>Interactive Question and Answer Session with NSF Staff.....</b>	438
<i>Robert Wellek</i>	
<b>Mathematics Taught in ChEmical Engineering, What Material Should Be Covered? What Should Be the Complexity? .....</b>	439
<i>Benito Serrano, Juan Jose Mejia, Victor Javier Cruz, Alfonso Talavera, Jesus Moreira</i>	
<b>Why We Should Teach Product Design.....</b>	450
<i>Soemantri Widagdo</i>	
<b>Computational ChEmical Engineering: Process Simulators, Math Solvers, Spreadsheets and Computer Programming Languages .....</b>	451
<i>Eric L. Maase</i>	
<b>Role of Scaling and up-Scaleing In the ChE Engineering Curriculum.....</b>	452
<i>Pedro E. Arce, Mario Oyanader</i>	
<b>Development of a ChEmical Engineering Comprehensive Concept Inventory.....</b>	453
<i>Jeff Csernica, Margot A.-S. Vigeant, Timothy M. Raymond, Michael J. Prince</i>	

<b>Do We Really Have to Teach Team Work, Conflict Resolution, Leadership, Etc, Etc, Etc...?</b>	454
<i>Laureano Jiménez-Esteller, Gonzalo Guillén-Gosálbez</i>	
<b>Teaching Process Safety in a Laboratory Setting</b>	455
<i>John C. Prindle</i>	
<b>Does Faculty Research Improve Undergraduate Teaching?</b>	456
<i>Michael J. Prince, Richard M. Felder, Rebecca Brent</i>	
<b>Design Course for Micropower Generation Devices</b>	457
<i>Alexander Mitsos</i>	
<b>Units of ChEmical Engineering Operations</b>	467
<i>Subbarao Duvvuri, Hilmi Mukhtar</i>	
<b>From Cold Cataracts to An Undergraduate Laboratory</b>	476
<i>Daniel Forciniti</i>	
<b>Integrating Pharmaceutical Engineering Research in Graduate, Undergraduate, and Pre-College Educational Activities</b>	484
<i>Piero M. Armenante, Henrik Pedersen</i>	
<b>Incorporating Microdevice Research into a Split-Level Elective Course for Undergraduate and Graduate Students</b>	485
<i>Adrienne R. Minerick</i>	
<b>Introduction to the NSF Workshop II</b>	496
<i>William B. Krantz</i>	
<b>Proposal Writing Tutorial</b>	497
<i>John Regalbuto, James M. Lee</i>	
<b>Introduction and Overview of the Format for Breakout Sessions</b>	498
<i>Robert Wellek</i>	
<b>Interactive Breakout Panels Coordinated by NSF Program Directors</b>	499
<i>Robert Wellek</i>	
<b>Panel Discussion: Building a Successful Relationship with Your Dean and Upper University Administration</b>	500
<i>Eduardo D. Glandt, Michael F. Malone, Kirk H. Schulz, Dianne Dorland, Harvey Stenger</i>	
<b>Abet Update</b>	501
<i>Jeffrey J. Sirola</i>	
<b>What's New with the ACS-Petroleum Research Fund</b>	502
<i>W. Christopher Hollinsed</i>	
<b>ChEmical Engineering Salary Survey</b>	506
<i>Geoffrey Price</i>	
<b>Integration and Segregation: Mixing Curricular Reform with Disciplinary Research</b>	507
<i>Joseph J. McCarthy</i>	
<b>Building Relationships with Alumni and Fundraising</b>	508
<i>Christopher Roberts</i>	
<b>Eroding Engineering Education: a Profession Under Threat</b>	509
<i>Colin S. Howat</i>	
<b>Modernizing the Content and Pedagogy of a Classic Textbook</b>	511
<i>Mark T. Swihart, Hendrick C. Van Ness</i>	
<b>Events That Shaped the ChEmical Industry</b>	512
<i>Rebecca K. Toghiani</i>	

<b>Practical Implementation of Data Acquisition to Enhance Problem-Based Learning in ChEmical Engineering Labs .....</b>	513
<i>Keith L. Levien</i>	
<b>The Trials and Tribulations of Implementing a Problem Based Learning Approach in the Freshman Year of ChEmical Engineering.....</b>	514
<i>Catherine A. Biggs, Diane Rossiter</i>	
<b>Ideas to Consider for NEW ChEmical Engineering Educators: Freshman and Sophomore Level Courses .....</b>	521
<i>Donald P. Visco, Jason M. Keith, David L. Silverstein</i>	
<b>Enhancement of Bioengineering Course with Results from Biophysics Research.....</b>	538
<i>Richard L. Long</i>	
<b>Weblab in ChEmical Engineering as a Tool for Cooperative Learning within a Global Environment. A Report of Experiences Between Brazilian Universities Connected through Kyatera .....</b>	539
<i>Galo A. C. Le Roux, Giann B. Reis, Charles D. F. de Jesus, Antonio J G Cruz, Roberto de C Giordano, Paulo F. Moreira, Luiz V Loureiro, Claudio A O Nascimento</i>	
<b>Global ChEmical Engineering Workforce Statistics .....</b>	545
<i>Tom R. Marrero</i>	
<b>Are We Preparing Our Students for a Flat World? .....</b>	546
<i>Nada M. Assaf-Anid, William F. Zucker, Gordon Silverman, Arthur T. Andrews</i>	
<b>Students and Graduates Exchange Programmes in the ChEmical Engineering Department of the University of Coimbra in Portugal .....</b>	547
<i>Maria da Graca Rasteiro</i>	
<b>The Nigerian Society of ChEmical Engineers: Challenges and Opportunitiesfacing ChEmical Engineers in Nigeria .....</b>	552
<i>Alexander O. Ogedegbe</i>	
<b>ChEmical Engineer for Today and Tomorrow through Curricular Reform .....</b>	559
<i>Álvaro Rámirez Sr.</i>	
<b>Student Learning through Engineers without Borders .....</b>	564
<i>Randy S. Lewis, W. Vincent Wilding</i>	
<b>Preparing 21st Century Engineering Students through a Student-Initiated Interdisciplinary Service-Learning Project.....</b>	565
<i>Alexander Bick, Dana Lazarus</i>	
<b>A Novel Interdisciplinary Biotechnology Process Engineering Laboratory Course at the University of Massachusetts Amherst .....</b>	572
<i>Susan C. Roberts, Louis A. Roberts</i>	
<b>ChEmical Engineering and the Development of the the Doctoral Portfolio Program at the University of Texas at Austin.....</b>	573
<i>Brian A. Korgel</i>	
<b>Mems (Microelectromechanical Systems) – a Model System for Interdisciplinary Design.....</b>	574
<i>Joseph J. Biernacki, Christopher D. Wilson, Satish Mahajan, Glenn T. Cunningham, Stephen A. Parke</i>	
<b>The Interdisciplinary Nature of Energy Applications. A Course In Carbon Capture and Sequestration.....</b>	575
<i>Jennifer Wilcox, Sally Benson</i>	
<b>D4: Drug Design, Development, and Delivery. A New Capstone Course for ChEm E's Interested In the Bio-Industries.....</b>	576
<i>Mark Prausnitz, Andreas S. Bommarius</i>	

<b>Remote Vs. Hands-on Laboratory Experiences: What Works and What Doesn't .....</b>	577
<i>David DiBiasio, Jim Henry, Marina Miletic, William M. Clark</i>	
<b>The University Power Plant: a Readily Accessible Remote Learning Platform.....</b>	580
<i>Kerry Dooley, F. Carl Knopf</i>	
<b>In Class Experience Using the Web and a New Text for Teaching Undergraduate Mass and Heat Transfer .....</b>	585
<i>T. W. Fraser Russell, Anne S. Robinson, Norman J. Wagner</i>	
<b>Use of Distance Learning Tools as Part of a Long Distance Non-Traditional Industrial PhD .....</b>	588
<i>Jeffrey R. Seay, Mario R. Eden</i>	
<b>Trilab – a Combined Remote, Virtual and Hands-on Laboratory System as a Novel Reusable Learning Object (RLO) for Supporting Engineering Laboratory Education .....</b>	589
<i>Zoltan K. Nagy, Mahmoud Abdulwahed</i>	
<b>Development of Remotely-Controlled Fluidized Bed Reactor for Distance Learning.....</b>	594
<i>Dmitry A. Sladkovsky, Nikolay V. Kuzichkin, Nickolay V. Lisitsyn</i>	
<b>Learning to Design Experiments - An Integrated Approach.....</b>	598
<i>Joseph J. Biernacki, Pedro E. Arce, Mario Oyanader, Ileana Carpen, Donald P. Visco</i>	
<b>Use of a Generalized Rubric for Teaching Students to Design Experiments.....</b>	599
<i>Claire Komives</i>	
<b>Simulation In the Unit Operations Laboratory: Comsol Multiphysics® Model of a CO<sub>2</sub> Absorber .....</b>	600
<i>William M. Clark, Yaminah Z. Jackson, Giacomo P. Ferraro</i>	
<b>Using Computational Methods to Design Experiments.....</b>	602
<i>David A. Gallagher</i>	
<b>Modifying a U.O. Lab Experiment to Make Ethanol Fuel from Grain .....</b>	603
<i>John Wagner, Majid Salim, Allen Hersel</i>	
<b>Teaching a Bioseparations Laboratory: From Training to Applied Research.....</b>	608
<i>Daniel Forciniti</i>	

#### **Author Index**